DECLARATION OF COMPLIANCE - SAR RF EXPOSURE EVALUATION (FCC/IC)

Test Lab Information	**Name**	**CELLTECH LABS INC.**			
	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada			
Applicant Information	**Name**	**VOCERA COMMUNICATIONS INC.**			
	Address	525 Race Street, Suite 150, San Jose, CA 95126 United States			
Standard(s) Applied	**FCC**	47 CFR §2.1093	**IC**	Health Canada Safety Code 6	
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C (01-01)			
		KDB 447498 - Mobile and Portable RF Exposure Procedures			
		KDB 248227 - SAR Measurement Procedures for 802.11a/b/g Transmitters			
		KDB 648474 - SAR Evaluation Considerations for Handsets with Multiple Tx'mttrs & Antennas			
	IC	RSS-102 Issue 4			
	IEEE	1528-2003			
	IEC	62209-1:2005; 62209-2:2010			
Device RF Exposure Category	**FCC/IC**	General Population / Uncontrolled Environment			
Device Classification(s)	**FCC**	Digital Transmission System (DTS)			
	IC	Low Power License-Exempt Radio-communication Device			
Device Identifier(s)	**FCC ID:**	QGZB3000			
	IC:	4362A-B3000			
Device Model(s)	B3000 Badge				
Test Sample Serial No.	F002E (Identical Prototype)				
Test Sample Hardware Rev. No.	Rev A (top assembly); Rev B (main circuit board)				
Test Sample Software Rev. No.	Build 101				
Date of Sample Receipt	August 09, 2011				
Measurement Date(s)	August 18-23, 2011				
Device Description	Portable Communications Badge with 802.11b/g WLAN & Bluetooth (Held-to-ear and Body-worn)				
Modulations & Data Rates	802.11b: DBPSK (1 Mbps), DQPSK (2 Mbps), CCK (5.5, 11 Mbps)				
	802.11g: OFDM (6, 9, 12, 24, 36, 48, 54 Mbps)				
Transmit Frequency Range(s)	2412 - 2462 MHz				
Antenna Type(s) Tested	Internal (Planar Inverted-F)				
Battery Type(s) Tested	Lithium-Polymer	3.7V, 600mAh	P/N: 230-01977		
Body-worn Accessories Tested	Lanyard	contains metal	P/N: 230-01995		
	Universal Clip	contains metal	P/N: 230-01985		
Audio Accessories Tested	Earpiece (Plantronics Jabra)		Headset (Plantronics Flex Grip)		
Max. SAR Level(s) Evaluated	**HEAD**	**1.04 W/kg**	**1g average**	**FCC/IC SAR Limit**	**1.6 W/kg**	**1g average**
	BODY	**0.564 W/kg**	**1g average**	**FCC/IC SAR Limit**	**1.6 W/kg**	**1g average**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was compliant with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2003, IEC International Standard 62209-1:2005 and IEC International Standard 62209-2:2010. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results and statements contained in this report pertain only to the device evaluated.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

Test Report Approved By		**Sean Johnston**	**Lab Manager**	**Celltech Labs Inc.**

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REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	Initial Release	Jon Hughes	September 06, 2011

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	**REPORT PREPARED BY**	**QA REVIEW BY**	**REPORT APPROVED BY**
Mike Meaker	Mike Meaker	Jon Hughes	Sean Johnston

1.0 INTRODUCTION

This measurement report demonstrates that the Vocera Communications Inc. Model: B3000 Portable Communications Badge with 802.11b/g WLAN and Bluetooth complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]), IEC International Standard 62209-1:2005 (see reference [6]) and IEC International Standard 62209-2:2010 (see reference [7]) were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for Head and/or Body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot utilizes a controller with built in VME-bus computer.

DASY4 System with SAM Twin Phantom V4.0C

DASY4 Measurement Server

3.0 RF CONDUCTED OUTPUT POWER

RF CONDUCTED OUTPUT POWER

Freq. (MHz)	Ch.	Power Setting	Average Conducted RF Output Power Levels (dBm)							
802.11b Mode			1 Mbps		2 Mbps		5.5 Mbps		11 Mbps	
2412	1	19	22.98		23.76		25.32		21.50	
2437	6	19	23.25		23.86		25.44		21.95	
2462	11	19	22.59		22.15		24.92		22.09	
802.11g Mode			6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
2412	1	16	24.40	25.03	24.38	25.13	24.95	23.79	25.39	22.89
2437	6	16	24.19	23.76	23.35	24.42	25.30	25.41	24.94	22.48
2462	11	16	24.52	24.69	24.61	24.46	25.90	25.13	25.56	22.35

Note: The conducted output power levels of the DUT could not be measured by Celltech Labs due to the internal antenna type. The reference conducted output power levels for each power setting were provided by Compliance Testing LLC.

4.0 ACCESSORY LISTING

Accessory ID # for Test Report	ACCESSORY CATEGORY:	BODY-WORN
	Part Number	Description
1	230-01995	Lanyard
2	230-01985	Universal Clip
Accessory ID # for Test Report	**ACCESSORY CATEGORY:**	**AUDIO**
	Model	**Description**
1	Plantronics Jabra	Earpiece
2	Plantronics Flex Grip	Headset

5.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS

Date: 08/18/2011		Frequency: 2450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	35.86	1.8	39.2	1.8	-8.52%	0.00%
2.360	35.83	1.8	39.2	1.8	-8.60%	0.00%
2.370	35.78	1.81	39.2	1.8	-8.72%	0.56%
2.380	35.73	1.82	39.2	1.8	-8.85%	1.11%
2.390	35.64	1.84	39.2	1.8	-9.08%	2.22%
2.400	35.78	1.85	39.2	1.8	-8.72%	2.78%
2.410	35.76	1.86	39.2	1.8	-8.78%	3.33%
2.412*	35.8	1.86	39.2	1.8	-8.67%	3.33%
2.420	35.72	1.86	39.2	1.8	-8.88%	3.33%
2.430	35.78	1.9	39.2	1.8	-8.72%	5.56%
2.437*	35.8	1.91	39.2	1.8	-8.67%	6.11%
2.440	35.87	1.91	39.2	1.8	-8.49%	6.11%
2.450	35.71	1.9	39.2	1.8	-8.90%	5.56%
2.460	35.76	1.92	39.2	1.8	-8.78%	6.67%
2.462*	35.7	1.93	39.2	1.8	-8.93%	7.22%
2.470	35.62	1.95	39.2	1.8	-9.13%	8.33%
2.480	35.68	1.94	39.2	1.8	-8.98%	7.78%
2.490	35.56	1.96	39.2	1.8	-9.29%	8.89%
2.500	35.52	1.97	39.2	1.8	-9.39%	9.44%
2.510	35.45	1.99	39.2	1.8	-9.57%	10.56%
2.520	35.41	2	39.2	1.8	-9.67%	11.11%
2.530	35.41	2	39.2	1.8	-9.67%	11.11%
2.540	35.41	2.03	39.2	1.8	-9.67%	12.78%
2.550	35.42	2.03	39.2	1.8	-9.64%	12.78%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Aug 18	2450 Head	23.0 °C	24.0 °C	≥ 15 cm	101.1 kPa	31%	1000

FLUID DIELECTRIC PARAMETERS

Date: 08/19/2011		Frequency: 2450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	36.01	1.8	39.2	1.8	-8.14%	0.00%
2.360	35.87	1.79	39.2	1.8	-8.49%	-0.56%
2.370	35.99	1.82	39.2	1.8	-8.19%	1.11%
2.380	35.92	1.81	39.2	1.8	-8.37%	0.56%
2.390	35.96	1.83	39.2	1.8	-8.27%	1.67%
2.400	35.88	1.83	39.2	1.8	-8.47%	1.67%
2.410	35.78	1.85	39.2	1.8	-8.72%	2.78%
2.420	35.83	1.85	39.2	1.8	-8.60%	2.78%
2.430	35.67	1.86	39.2	1.8	-9.01%	3.33%
2.440	35.62	1.89	39.2	1.8	-9.13%	5.00%
2.450	35.56	1.89	39.2	1.8	-9.29%	5.00%
2.460	35.57	1.92	39.2	1.8	-9.26%	6.67%
2.462*	35.5	1.92	39.2	1.8	-9.44%	6.67%
2.470	35.41	1.93	39.2	1.8	-9.67%	7.22%
2.480	35.35	1.92	39.2	1.8	-9.82%	6.67%
2.490	35.5	1.94	39.2	1.8	-9.44%	7.78%
2.500	35.58	1.97	39.2	1.8	-9.23%	9.44%
2.510	35.42	1.97	39.2	1.8	-9.64%	9.44%
2.520	35.36	1.96	39.2	1.8	-9.80%	8.89%
2.530	35.22	1.98	39.2	1.8	-10.15%	10.00%
2.540	35.13	2.01	39.2	1.8	-10.38%	11.67%
2.550	35.23	2.01	39.2	1.8	-10.13%	11.67%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Aug 19	2450 Head	23.0 °C	24.0 °C	≥ 15 cm	101.1 kPa	31%	1000

FLUID DIELECTRIC PARAMETERS

Date: 08/22/2011		Frequency: 2450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	36.4	1.76	39.2	1.8	-7.14%	-2.22%
2.360	36.34	1.78	39.2	1.8	-7.30%	-1.11%
2.370	36.36	1.8	39.2	1.8	-7.24%	0.00%
2.380	36.19	1.81	39.2	1.8	-7.68%	0.56%
2.390	36.19	1.83	39.2	1.8	-7.68%	1.67%
2.400	36.2	1.82	39.2	1.8	-7.65%	1.11%
2.410	36.06	1.84	39.2	1.8	-8.01%	2.22%
2.420	35.97	1.84	39.2	1.8	-8.24%	2.22%
2.430	36.04	1.86	39.2	1.8	-8.06%	3.33%
2.437*	36.1	1.87	39.2	1.8	-7.91%	3.89%
2.440	36.13	1.88	39.2	1.8	-7.83%	4.44%
2.450	36.02	1.88	39.2	1.8	-8.11%	4.44%
2.460	36.04	1.9	39.2	1.8	-8.06%	5.56%
2.462*	36	1.9	39.2	1.8	-8.16%	5.56%
2.470	35.94	1.91	39.2	1.8	-8.32%	6.11%
2.480	35.71	1.94	39.2	1.8	-8.90%	7.78%
2.490	35.88	1.94	39.2	1.8	-8.47%	7.78%
2.500	35.64	1.93	39.2	1.8	-9.08%	7.22%
2.510	35.64	1.96	39.2	1.8	-9.08%	8.89%
2.520	35.64	1.98	39.2	1.8	-9.08%	10.00%
2.530	35.54	1.98	39.2	1.8	-9.34%	10.00%
2.540	35.61	2	39.2	1.8	-9.16%	11.11%
2.550	35.46	2.03	39.2	1.8	-9.54%	12.78%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Aug 22	2450 Head	24.0 °C	24.0 °C	≥ 15 cm	101.1 kPa	37%	1000

FLUID DIELECTRIC PARAMETERS

Date: 08/23/2011		Frequency: 2450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	36.74	1.77	39.2	1.8	-6.28%	-1.67%
2.360	36.65	1.78	39.2	1.8	-6.51%	-1.11%
2.370	36.44	1.79	39.2	1.8	-7.04%	-0.56%
2.380	36.61	1.81	39.2	1.8	-6.61%	0.56%
2.390	36.62	1.81	39.2	1.8	-6.58%	0.56%
2.400	36.39	1.82	39.2	1.8	-7.17%	1.11%
2.410	36.35	1.84	39.2	1.8	-7.27%	2.22%
2.420	36.34	1.84	39.2	1.8	-7.30%	2.22%
2.430	36.46	1.86	39.2	1.8	-6.99%	3.33%
2.440	36.26	1.87	39.2	1.8	-7.50%	3.89%
2.450	36.36	1.9	39.2	1.8	-7.24%	5.56%
2.460	36.32	1.9	39.2	1.8	-7.35%	5.56%
2.462*	36.3	1.9	39.2	1.8	-7.40%	5.56%
2.470	36.29	1.92	39.2	1.8	-7.42%	6.67%
2.480	36.33	1.91	39.2	1.8	-7.32%	6.11%
2.490	36.05	1.93	39.2	1.8	-8.04%	7.22%
2.500	35.94	1.94	39.2	1.8	-8.32%	7.78%
2.510	35.96	1.96	39.2	1.8	-8.27%	8.89%
2.520	35.87	1.96	39.2	1.8	-8.49%	8.89%
2.530	36.02	1.98	39.2	1.8	-8.11%	10.00%
2.540	35.81	2.01	39.2	1.8	-8.65%	11.67%
2.550	35.8	2.01	39.2	1.8	-8.67%	11.67%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Aug 23	2450 Head	23.0 °C	24.0 °C	≥ 15 cm	101.1 kPa	44%	1000

FLUID DIELECTRIC PARAMETERS

Date: 08/23/2011		Frequency: 2450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	50.65	1.85	52.7	1.95	-3.89%	-5.13%
2.360	50.43	1.85	52.7	1.95	-4.31%	-5.13%
2.370	50.41	1.86	52.7	1.95	-4.35%	-4.62%
2.380	50.39	1.88	52.7	1.95	-4.38%	-3.59%
2.390	50.18	1.93	52.7	1.95	-4.78%	-1.03%
2.400	49.91	1.92	52.7	1.95	-5.29%	-1.54%
2.410	50.19	1.93	52.7	1.95	-4.76%	-1.03%
2.420	50.23	1.98	52.7	1.95	-4.69%	1.54%
2.430	50.16	1.99	52.7	1.95	-4.82%	2.05%
2.437*	50.2	1.99	52.7	1.95	-4.74%	2.05%
2.440	50.22	1.99	52.7	1.95	-4.71%	2.05%
2.450	50.48	1.98	52.7	1.95	-4.21%	1.54%
2.460	50.26	1.99	52.7	1.95	-4.63%	2.05%
2.462*	50.2	1.99	52.7	1.95	-4.74%	2.05%
2.470	50.01	2.01	52.7	1.95	-5.10%	3.08%
2.480	50.03	2	52.7	1.95	-5.07%	2.56%
2.490	49.94	2.05	52.7	1.95	-5.24%	5.13%
2.500	49.72	2.05	52.7	1.95	-5.65%	5.13%
2.510	49.84	2.06	52.7	1.95	-5.43%	5.64%
2.520	49.68	2.08	52.7	1.95	-5.73%	6.67%
2.530	49.91	2.13	52.7	1.95	-5.29%	9.23%
2.540	49.84	2.11	52.7	1.95	-5.43%	8.21%
2.550	49.87	2.12	52.7	1.95	-5.37%	8.72%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Aug 23	2450 Body	23.0 °C	23.6 °C	≥ 15 cm	101.1 kPa	44%	1000

6.0 SAR MEASUREMENT SUMMARY

HEAD SAR EVALUATION SUMMARY

Test Config.	Test Date	Plot #	Test Freq.	Ch.	Mode	Data Rate	Phantom Section	Test Position	Conducted RF Output Power Level Setting Before Test	SAR Drift During Test	Measured SAR (1g)
			MHz			Mbps				dB	W/kg
HEAD	8/18	F1	2437	6	802.11b	1	Left Ear	Cheek/Touch	19	-0.005	0.802
	8/18	F2	2437	6	802.11b	5.5	Left Ear	Cheek/Touch	19	-0.234	1.04
	8/18	F3	2437	6	802.11b	5.5	Left Ear	Ear/Tilt (15°)	19	-0.178	0.258
	8/22	F4	2437	6	802.11b	5.5	Right Ear	Cheek/Touch	19	-0.523	0.557
	8/22	F5	2437	6	802.11b	5.5	Right Ear	Ear/Tilt (15°)	19	-0.268	0.262
	8/18	F6	2412	1	802.11b	5.5	Left Ear	Cheek/Touch	19	-0.210	0.955
	8/18	F7	2462	11	802.11b	5.5	Left Ear	Cheek/Touch	19	-0.115	0.824
	8/23	F8	2462	11	802.11g	6	Left Ear	Cheek/Touch	16	-0.270	0.385
	8/23	F9	2462	11	802.11g	24	Left Ear	Cheek/Touch	16	-0.141	0.353
	8/19	F10	2462	11	802.11g	24	Left Ear	Ear/Tilt (15°)	16	-0.306	0.122
	8/19	F11	2462	11	802.11g	24	Right Ear	Cheek/Touch	16	-0.565	0.285
	8/22	F12	2462	11	802.11g	24	Right Ear	Ear/Tilt (15°)	16	-0.317	0.112

SAR SAFETY LIMIT(S)		HEAD	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	1.6 W/kg	1g average	General Population / Uncontrolled

Notes

1.	Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2.	For 802.11b mode, the DUT was evaluated at the highest output power channel in the lowest data rate. The output power level of the higher data rate 5.5 Mbps was the maximum reported conducted power level (> ¼ dB higher than the lowest data rate) and was evaluated at the highest output power channel. The maximum SAR level configuration was further evaluated at the remaining default test channels.
3.	For 802.11g mode, the DUT was evaluated at the highest output power channel in the lowest data rate. The output power level of the higher data rate 24 Mbps was the maximum reported conducted power level (> ¼ dB higher than the lowest data rate) and was evaluated at the highest output power channel. The maximum SAR level configuration was < 0.8 W/kg (> 50% below the SAR limit) and therefore the remaining default test channels were not required to be evaluated (per FCC KDB 447498 & 248227).
4.	The DUT was placed in test mode via internal test software protocol provided by Vocera for modulated continuous transmission and enable the selection of mode, channel, data rate, and output level setting prescribed by the manufacturer.
5.	The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. Some of the SAR droop values are > 5% from the start of the test; the max. droop value is included in the uncertainty budget table (Section 21).
6.	The DUT battery was fully charged prior to each SAR evaluation.
7.	The fluid temperature remained within +/-2°C from the dielectric parameter measurement to the completion of each SAR test.
8.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

BODY SAR EVALUATION SUMMARY

Test Config.	Test Date	Plot #	Freq.	Ch.	Mode	Data Rate	Accessory ID # (see Section 4.0)		DUT Distance to Planar Phantom	Conducted RF Output Power Level Setting Before Test	SAR Drift During Test	Measured SAR (1g)
			MHz			Mbps	Body-worn	Audio			dB	W/kg
BODY	8/23	B1	2437	6	802.11b	1	1	1	Touch	19	-0.287	0.446
	8/23	B2	2437	6	802.11b	5.5	1	n/a	Touch	19	-0.333	0.441
	8/23	B3	2437	6	802.11b	5.5	1	1	Touch	19	-0.107	**0.564**
	8/23	B4	2437	6	802.11b	5.5	1	2	Touch	19	-0.225	0.499
	8/23	B5	2437	6	802.11b	5.5	2	n/a	Touch	19	-0.190	0.451
	8/23	B6	2437	6	802.11b	5.5	2	1	Touch	19	0.015	0.445
	8/23	B7	2437	6	802.11b	5.5	2	2	Touch	19	0.021	0.438
	8/23	B8	2462	11	802.11g	6	1	1	Touch	16	-0.220	0.233
	8/23	B9	2462	11	802.11g	24	1	n/a	Touch	16	0.088	0.293
	8/23	B10	2462	11	802.11g	24	1	1	Touch	16	-0.014	0.316
	8/23	B11	2462	11	802.11g	24	1	2	Touch	16	-0.324	0.250
	8/23	B12	2462	11	802.11g	24	2	n/a	Touch	16	-0.070	0.266
	8/23	B13	2462	11	802.11g	24	2	1	Touch	16	-0.084	0.264
	8/23	B14	2462	11	802.11g	24	2	2	Touch	16	-0.004	0.246

SAR SAFETY LIMIT(S)		BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	1.6 W/kg	1g average	General Population / Uncontrolled

Notes

1.	Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2.	For 802.11b mode, the DUT was evaluated at the highest output power channel in the lowest data rate. The output power level of the higher data rate 5.5 Mbps was the maximum reported conducted power level (> ¼ dB higher than the lowest data rate) and was evaluated at the highest output power channel. The maximum SAR level configuration was < 0.8 W/kg (> 50% below the SAR limit) and therefore the remaining default test channels were not required to be evaluated (per FCC KDB 447498 & 248227).
3.	For 802.11g mode, the DUT was evaluated at the highest output power channel in the lowest data rate. The output power level of the higher data rate 24 Mbps was the maximum reported conducted power level (> ¼ dB higher than the lowest data rate) and was evaluated at the highest output power channel. The maximum SAR level configuration was < 0.8 W/kg (> 50% below the SAR limit) and therefore the remaining default test channels were not required to be evaluated (per FCC KDB 447498 & 248227).
4.	The DUT was placed in test mode via internal test software protocol provided by Vocera for modulated continuous transmission and enable the selection of mode, channel, data rate, and output level setting prescribed by the manufacturer.
5.	The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. Some of the SAR droop values are > 5% from the start of the test; the max. droop value (Head) is included in the uncertainty budget table (Section 21).
6.	The DUT battery was fully charged prior to each SAR evaluation.
7.	The fluid temperature remained within +/-2°C from the dielectric parameter measurement to the completion of each SAR test.
8.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

7.0 SAR LEVEL ADJUSTMENT FOR FLUID SENSITIVITY

The measured fluid dielectric properties for 2450 MHz Head tissue simulant were outside the 5% measurement protocol tolerance as reported in the table below. Chapter 22 of the SAR system manufacturer's DASY4 Manual (see reference [12]) provides the following calculation formula for making fluid sensitivity adjustments to the measured SAR values:

% Change in SAR = Sensitivity * % Change in Value

Measured Fluid Parameters:

Test Date	Freq (GHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
Aug 18	2.412*	35.8	1.86	39.2	1.8	-8.67%	3.33%
Aug 18	2.437*	35.8	1.91	39.2	1.8	-8.67%	6.11%
Aug 18	2.450	35.71	1.9	39.2	1.8	-8.90%	5.56%
Aug 18	2.462*	35.7	1.93	39.2	1.8	-8.93%	7.22%
Aug 19	2.462*	35.5	1.92	39.2	1.8	-9.44%	6.67%
Aug 22	2.437*	36.1	1.87	39.2	1.8	-7.91%	3.89%
Aug 22	2.450	36.02	1.88	39.2	1.8	-8.11%	4.44%
Aug 22	2.462*	36	1.9	39.2	1.8	-8.16%	5.56%
Aug 23	2.462*	36.3	1.9	39.2	1.8	-7.40%	5.56%

**interpolated using DASY4 software*

Since the measured permittivity is lower than the target value and the measured conductivity is higher than the target value, the measured SAR value is already overestimated. Therefore, no adjustment is required to be made to the measured SAR values.

8.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within ±50 MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within ±100 MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals, ±25 MHz < 300 MHz and ±50 MHz ≥300 MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [11]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	±50 MHz ≥ 300 MHz
2450 MHz	2412 MHz	38 MHz	< 50 MHz
	2437 MHz	13 MHz	< 50 MHz
	2462 MHz	12 MHz	< 50 MHz

The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps are not required for this evaluation.

9.0 DETAILS OF SAR EVALUATION

The Vocera Communications Inc. Model: B3000 Portable Communications Badge with 802.11b/g WLAN and Bluetooth was compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A. The detailed test setup photographs are shown in Appendix D.

Ear-held Configuration

1) The DUT was tested in an ear-held configuration on both the left and right head sections of the SAM phantom.

a) The DUT was placed in the device holder in a normal operating position with the test device reference point located along the vertical centerline on the front of the device aligned to the ear reference point, with the center of the earpiece touching the center of the ear spacer of the SAM phantom.

b) With the DUT positioned parallel to the cheek, the test device reference point was aligned to the ear reference point on the head phantom, and the vertical centerline was aligned to the phantom reference plane (initial ear position).

c) While maintaining the three alignments, the body of the handset was gradually adjusted to each of the following test positions:

- Cheek/Touch Position: the handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.

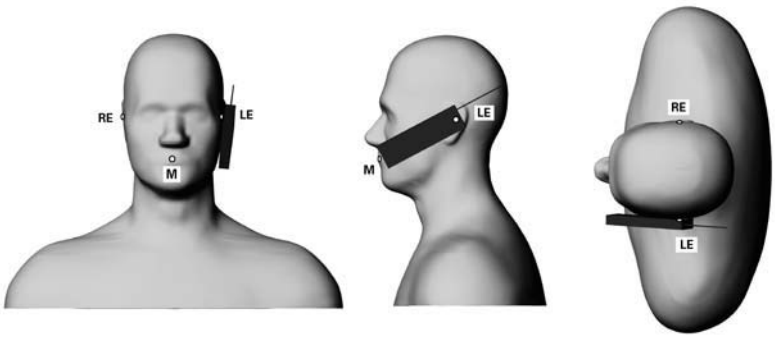


Figure 1. Position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for device positioning, are indicated (Shoulders are shown for illustration only).

- Ear/Tilt Position: With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.

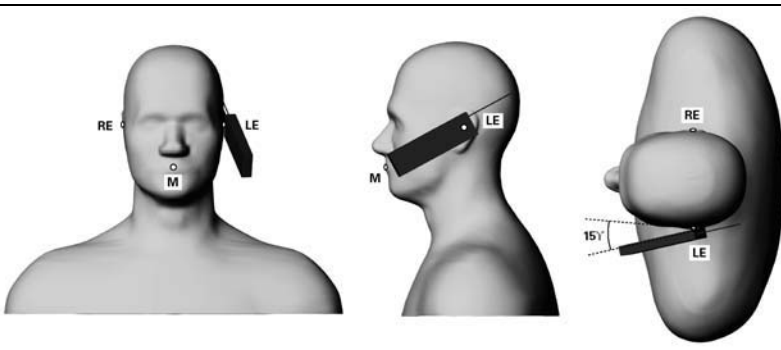


Figure 2. Position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for device positioning, are indicated (Shoulders are shown for illustration only).

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration

2) The DUT was tested with the Lanyard body-worn accessory with the back side of the DUT touching the outer surface of the SAM phantom planar section.
3) The DUT was tested with the Universal Clip body-worn accessory with the back side of the DUT touching the outer surface of the SAM phantom planar section.
4) The body-worn SAR evaluations were performed with each of the audio accessories connected consecutively.
5) Body-worn SAR evaluations were also performed without an audio accessory connected (speaker-phone mode).

10.0 CO-LOCATED TRANSMITTER ASSESSMENT

The co-located Bluetooth transmitter does not transmit simultaneously with the WLAN; therefore simultaneous transmission considerations and assessment in accordance with FCC KDB 447498 and KDB 648474 were not required.

11.0 SAR EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.
An area scan was determined as follows:

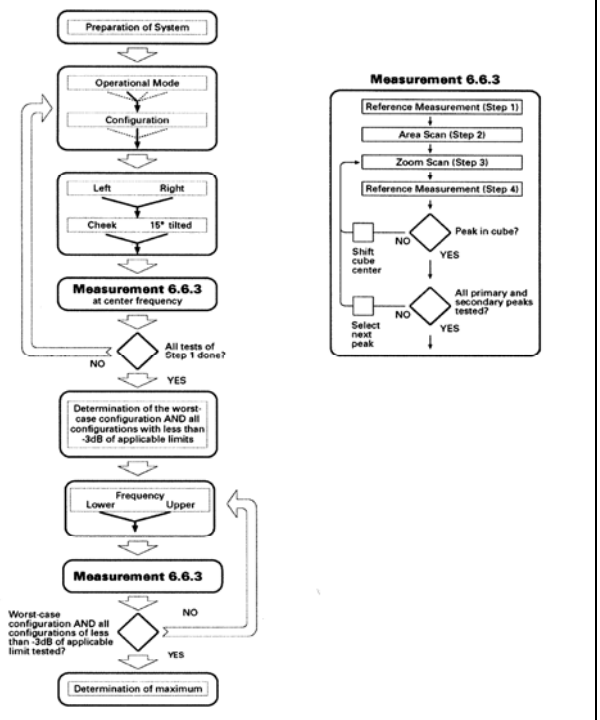
c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1g and 10g spatial peak SAR was determined as follows:

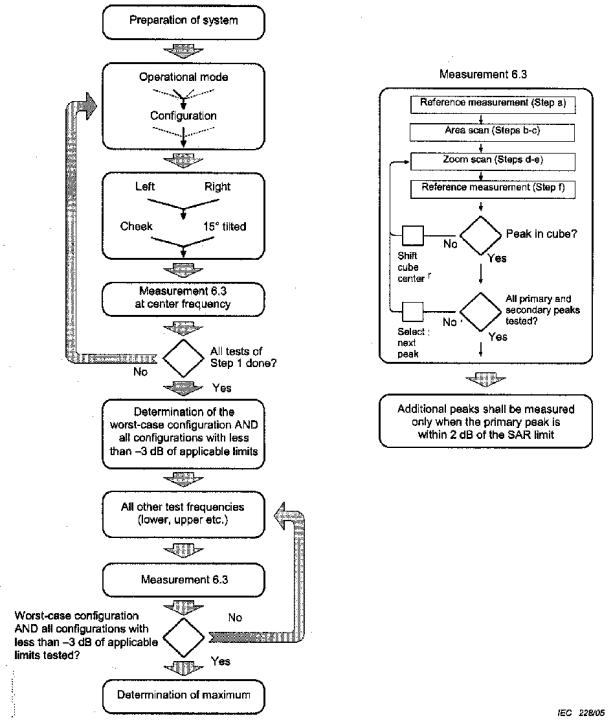
e. Extrapolation is used to determine the values between the dipole center of the probe and the surface of the phantom. This data cannot be measured because the center of the dipole sensors is 1.0 mm away from the probe tip and the distance between the probe and the boundary must be larger than 25% of the probe diameter. The probe diameter is 2.4 mm. In the DASY4 software, the distance between the sensor center and phantom surface is set to 2.0 mm. This provides a distance of 1.0 mm between the probe tip and the surface. The extrapolation of the values between the dipole center and the surface of the phantom was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5x5x7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7x7x7 points) to ensure complete capture of the peak spatial-average SAR.



Flow Chart for determining the largest peak spatial-average SAR from all device configurations per IEEE Standard 1528-2003 (see reference [5]).



Block diagram of the tests to be performed per IEC International Standard 62209-1:2005 (see reference [6]).

12.0 SYSTEM PERFORMANCE CHECK

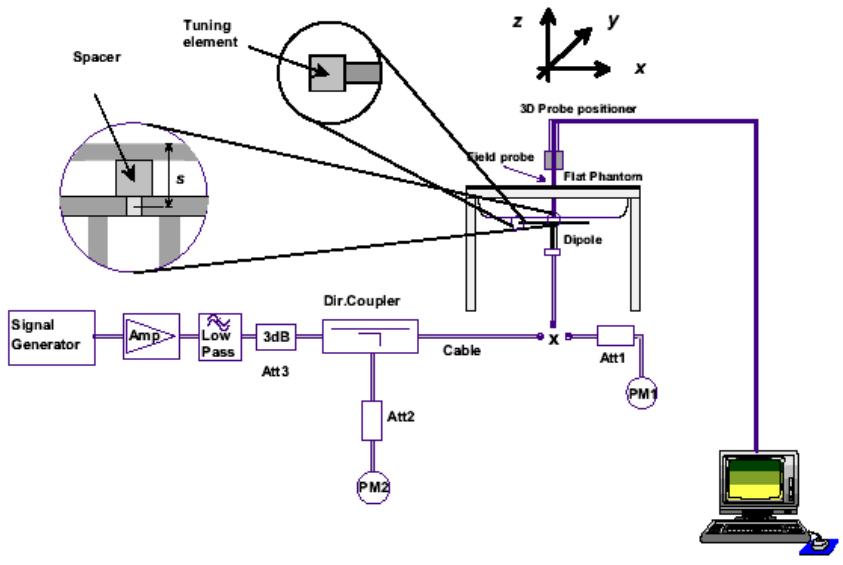
Prior to the SAR evaluations, a daily system check was performed at the planar section of the SAM phantom with a 2450MHz SPEAG validation dipole (see Appendix B for system performance check test plots) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]) and IEC 62209-1:2005 (see reference [6]). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Aug 18	HEAD 2450	13.6 ±10%	13.8	+1.5%	39.2 ±5%	35.7	-8.9%	1.80 ±5%	1.90	+5.6%	1000	23.0	24.0	≥ 15	31	101.1
Aug 22	HEAD 2450	13.6 ±10%	14.8	+8.8%	39.2 ±5%	36.0	-8.2%	1.80 ±5%	1.88	+4.4%	1000	24.0	24.0	≥ 15	37	101.1
Aug 23	BODY 2450	12.9 ±10%	13.9	+7.8%	52.7 ±5%	50.5	-4.2%	1.95 ±5%	1.98	+1.5%	1000	23.0	23.6	≥ 15	44	101.1

Note(s)

1. The target SAR value is the measured value from the dipole calibration performed by SPEAG (see Appendix E).
2. The target dielectric parameters are the nominal values from the dipole calibration performed by SPEAG (see Appendix E).
3. The measured fluid dielectric properties for 2450 MHz Head tissue simulant were outside the 5% measurement protocol tolerance. Please refer to Section 7.0 of this report for SAR sensitivity adjustment procedures applied per the DASY4 manual.
4. The DUT Head SAR evaluations on August 19 were performed within 24 hours of the system performance check on August 18.
5. The DUT Head SAR evaluations on August 23 were performed within 24 hours of the system performance check on August 22.
6. The fluid temperature remained within +/-2°C from the dielectric parameter measurement to the completion of the evaluation.
7. The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



System Performance Check Measurement Setup Diagram (IEEE 1528-2003)

2450 MHz Validation Dipole Setup

13.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe listed in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see reference [13] and [14]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]) and IEC 62209-1:2005 (see reference [6]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

1900 MHz SIMULATED TISSUE MIXTURES		
INGREDIENT	**2450 MHz Head**	**2450 MHz Body**
Water	52.00 %	69.98 %
Glycol Monobutyl	48.00 %	30.00 %
Salt	-	0.02 %

14.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	**Health Canada Safety Code 6**	**(General Population / Uncontrolled Exposure)**	**(Occupational / Controlled Exposure)**
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		**1.6 W/kg**	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
The Spatial Average value of the SAR averaged over the whole body.			
The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.			
Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.			

15.0 ROBOT SYSTEM SPECIFICATIONS

Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info.; Optical uplink for commands and clock
DASY4 Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	EX3DV4
Serial No.	3600
Construction	Symmetrical design with triangular core
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom(s)	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters

16.0 PROBE SPECIFICATION (EX3DV4)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. DGBE)
Calibration:	Basic Broadband Calibration in air: 10-3000 MHz Conversion Factors (CF) for HSL 900 and HSL 1750
Frequency:	10 MHz to >6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity:	±0.3 dB in HSL (rotation around probe axis) ±0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range:	10 μW/g to >100 mW/g; Linearity: ±0.2 dB (noise: typically < 1 μW/g)
Dimensions:	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1.0 mm
Application:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.

EX3DV4 E-Field Probe

17.0 SAM TWIN PHANTOM V4.0C

The SAM Twin Phantom V4.0C is a fiberglass shell phantom with a 2.0 mm (+/-0.2 mm) shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections (see Appendix G for specifications of the SAM Twin Phantom V4.0C).

SAM Twin Phantom V4.0C

18.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Holder

19.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	27Apr10	Biennial
x	-EX3DV4 E-Field Probe	00213	3600	23Jun11	Annual
x	-D2450V2 Validation Dipole	00219	825	21Apr09	Triennial
x	-SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	None	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required; N/A = Not Applicable				

20.0 JUSTIFICATION FOR EXTENDED SAR DIPOLE CALIBRATION

SAR dipoles calibrated less than three years ago but more than one year ago were confirmed by maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5Ω from prior calibration) requirements per extended calibration procedures specified in FCC KDB 450824 (see reference [11]).

SPEAG D2450V2 SN: 825							
Date of Measurement	**Place of Measurement**	**Frequency**	**Fluid Type**	**Return Loss (dB)**	**Δ %**	**Impedance (Ω)**	**Δ Ω**
Apr. 17, 2009	SPEAG	2450 MHz	Head	-24.1	-	54.5	-
Aug. 23, 2011	Celltech			-23.8	1.2%	56.6	2.1
Apr. 17, 2009	SPEAG	2450 MHz	Body	-24.8	-	49.2	-
Feb. 18, 2011	Celltech			- 23.7	4.4%	54.2	5

21.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION

Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V_i or V_{eff}
Measurement System									
Probe Calibration (2450 MHz)	E.2.1	6.0	Normal	1	1	1	6.0	6.0	∞
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	14	Rectangular	1.732050808	1	1	8.1	8.1	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measured)	E.3.3	7.22	Normal	1	0.64	0.43	4.6	3.1	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	9.44	Normal	1	0.6	0.49	5.7	4.6	∞
Combined Standard Uncertainty			**RSS**				**14.94**	**14.07**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**29.89**	**28.15**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

22.0 REFERENCES

[1] Federal Communications Commission - “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093.

[2] Health Canada - “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6: 1999.

[3] Federal Communications Commission - “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[4] Industry Canada - “Radio Frequency Exposure Compliance of Radio Communication Apparatus (All Frequency Bands)”, Radio Standards Specification RSS-102 Issue 4: March 2010.

[5] IEEE Standard 1528-2003 - “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”: December 2003.

[6] International Standard IEC 62209-1:2005 - “Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures.”

[7] International Standard IEC 62209-2 Edition 1.0 2010-03 - “Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)”.

[8] Federal Communications Commission, Office of Engineering and Technology - “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”; KDB 447498 D01 v04: November 2009.

[9] Federal Communications Commission, Office of Engineering and Technology - “SAR Measurement Procedures for 802.11a/b/g Transmitters”; KDB 248227 D01 v01r02: May 2007.

[10] Federal Communications Commission, Office of Engineering and Technology - “SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas”; KDB 648474 D01 v01r05: September 2008.

[11] Federal Communications Commission, Office of Engineering and Technology - “Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz”; KDB 450824 D01 v01r01: January 2007.

[12] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 22 Application Note, SAR Sensitivities: Sept. 2005.

[13] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.

[14] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.

[15] International Standard ISO/IEC 17025:2005 - “General requirements for the competence of testing and calibration laboratories”.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Test Date: 08/18/2011

System Performance Check - 2450 MHz Dipole - Head

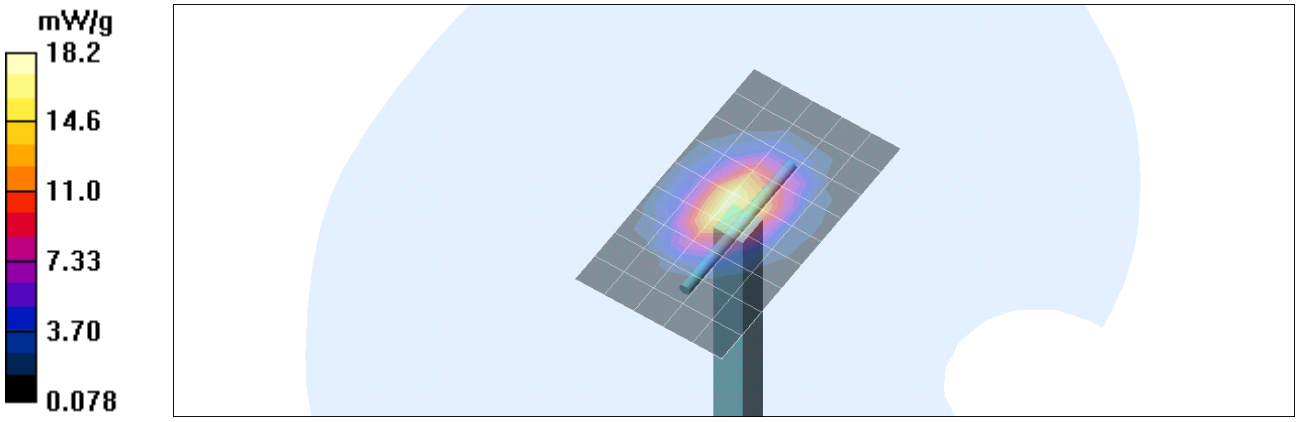
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 17/04/2009

Ambient Temp: 23.0C; Fluid Temp: 24.0C; Barometric Pressure: 101.1 kPa; Humidity: 44%

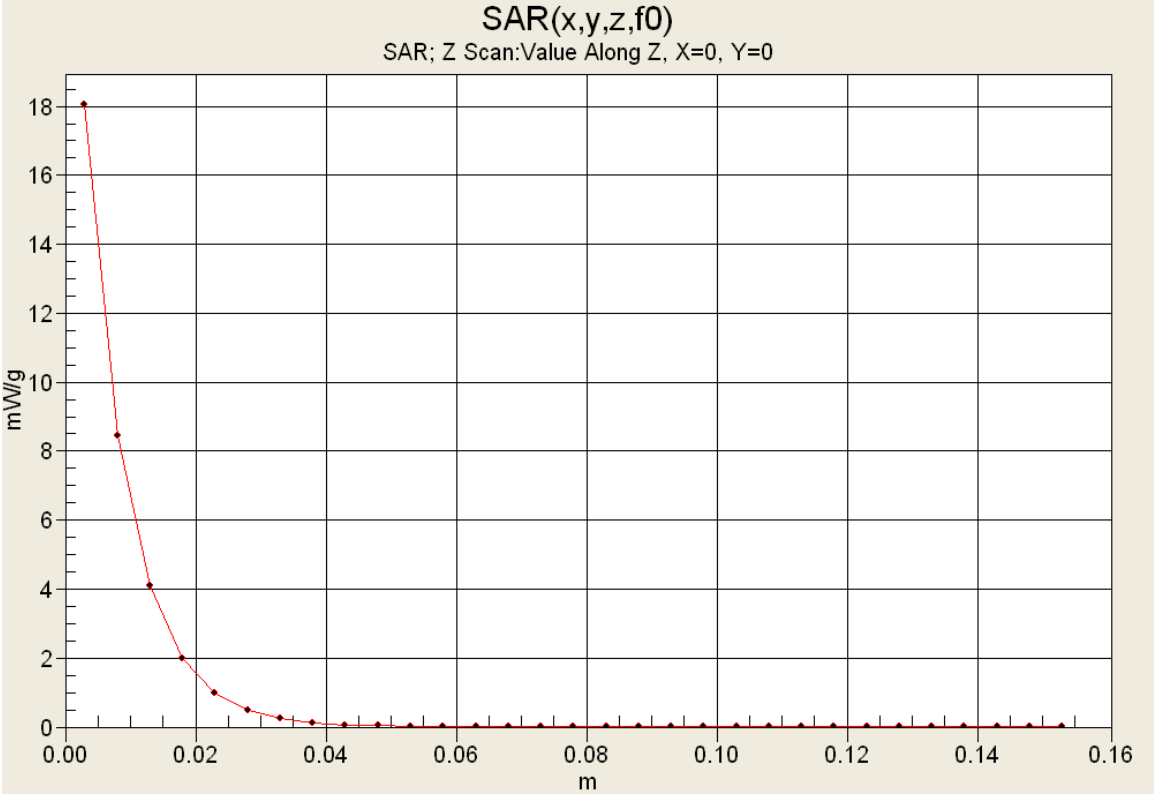
Communication System: CW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; σ = 1.9 mho/m; ε_r = 35.7; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.55, 6.55, 6.55); Calibrated: 23/06/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head, d=10mm, Pin = 250mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 16.8 mW/g
Head, d=10mm, Pin = 250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.1 V/m; Power Drift = 0.014 dB
Peak SAR (extrapolated) = 29.6 W/kg
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.28 mW/g
Maximum value of SAR (measured) = 18.2 mW/g



Z-axis Scan


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
18
16
14
12
10
8
6
4
2
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Test Date: 08/22/2011

System Performance Check - 2450 MHz Dipole - Head

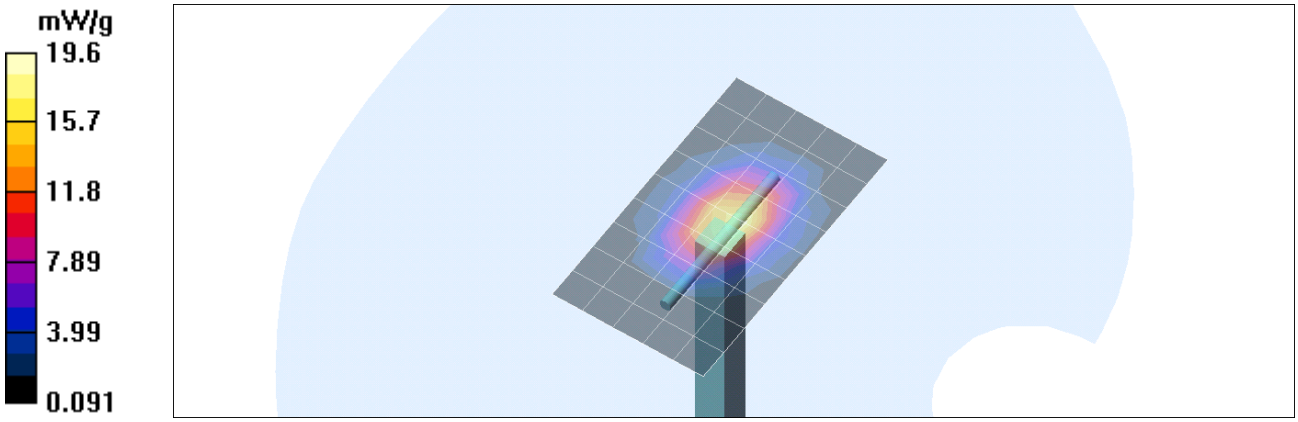
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 17/04/2009

Ambient Temp: 24.0C; Fluid Temp: 24.0C; Barometric Pressure: 101.1 kPa; Humidity: 37%

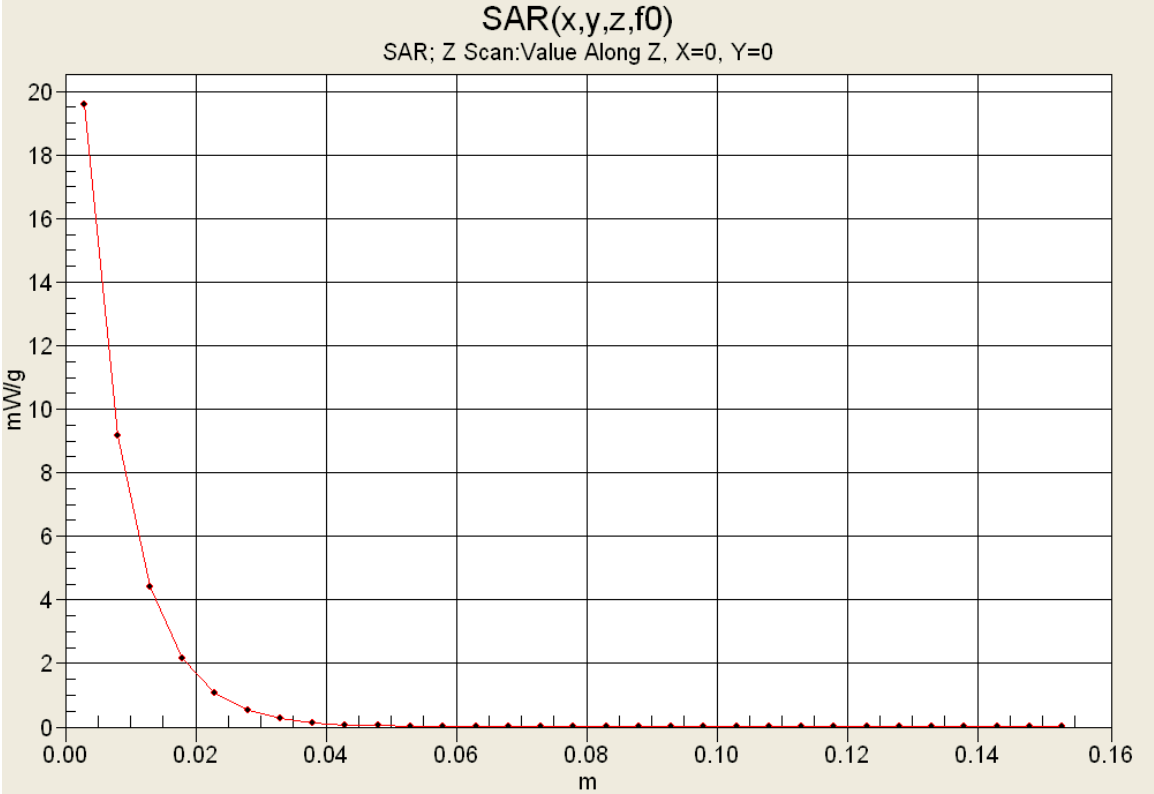
Communication System: CW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used: f = 2450 MHz; σ = 1.88 mho/m; ε_r = 36; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.55, 6.55, 6.55); Calibrated: 23/06/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head, d=10mm, Pin = 250mW 2/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.5 mW/g
Head, d=10mm, Pin = 250mW 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 32.1 W/kg
SAR(1 g) = 14.8 mW/g; SAR(10 g) = 6.74 mW/g
Maximum value of SAR (measured) = 19.6 mW/g



Z-axis Scan


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
20
18
16
14
12
10
8
6
4
2
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Test Date: 08/23/2011

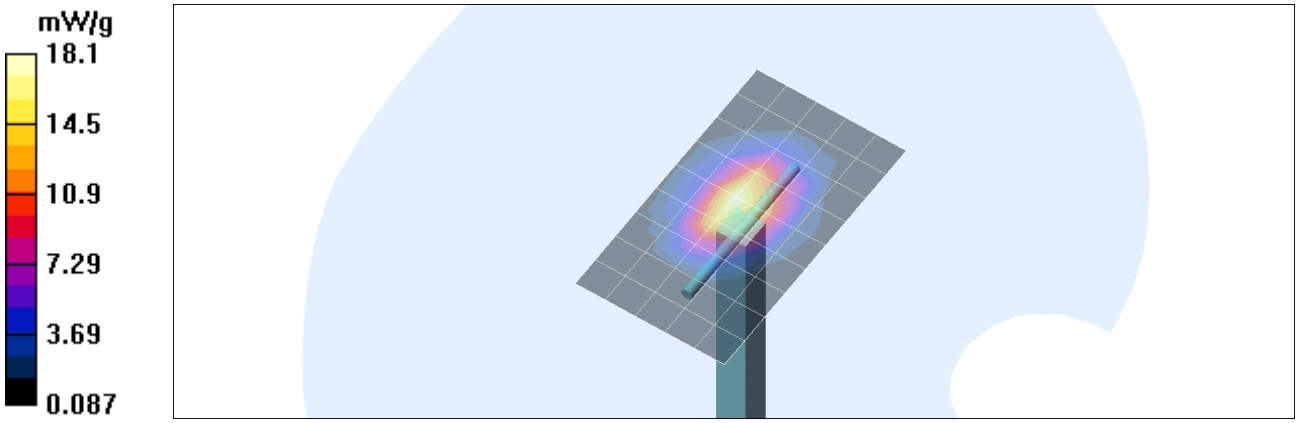
System Performance Check - 2450 MHz Dipole - Body

Ambient Temp: 23.0C; Fluid Temp: 23.6C; Barometric Pressure: 101.1 kPa; Humidity: 44%

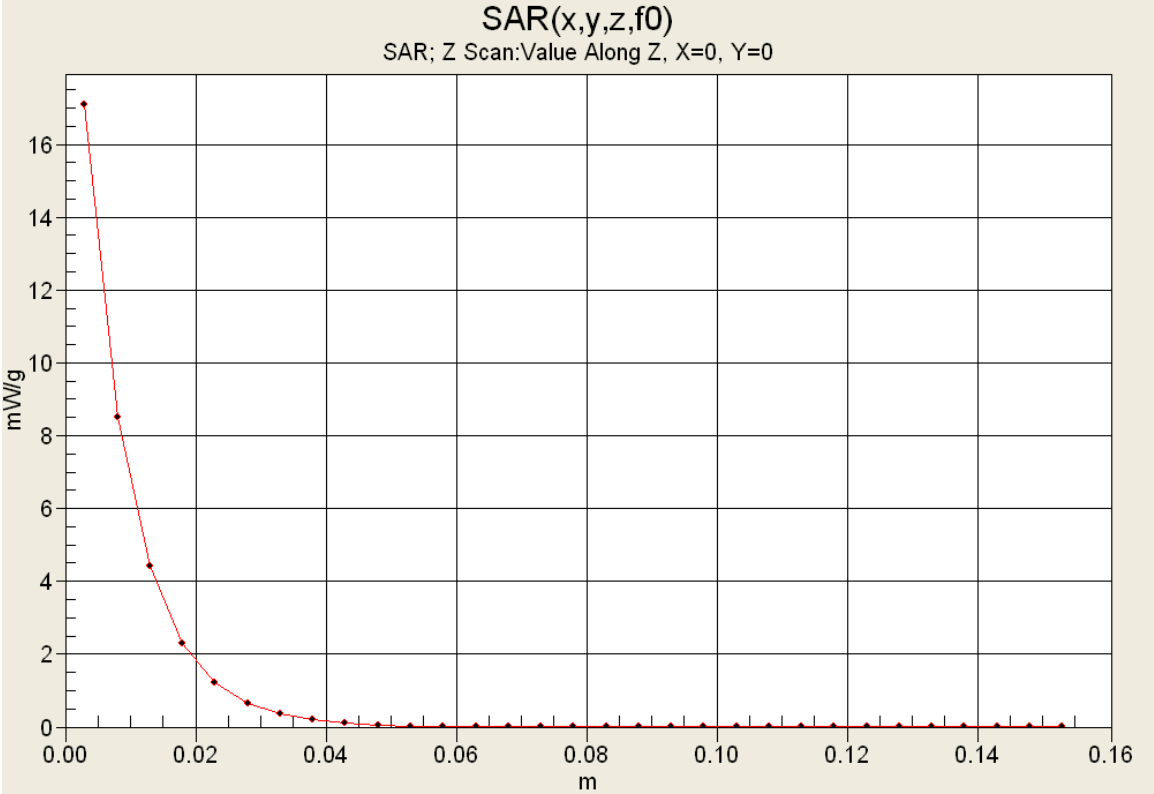
Communication System: CW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.15, 6.15, 6.15); Calibrated: 23/06/2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body, d=10mm, Pin = 250mW 3 2/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 17.5 mW/g
Body, d=10mm, Pin = 250mW 3 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.6 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.41 mW/g
Maximum value of SAR (measured) = 18.1 mW/g



Z-axis Scan


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
16
14
12
10
8
6
4
2
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

2450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
18/Aug/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	35.86	1.80
2.3600	39.36	1.72	35.83	1.80
2.3700	39.34	1.73	35.78	1.81
2.3800	39.32	1.74	35.73	1.82
2.3900	39.31	1.75	35.64	1.84
2.4000	39.29	1.76	35.78	1.85
2.4100	39.27	1.76	35.76	1.86
2.4200	39.25	1.77	35.72	1.86
2.4300	39.24	1.78	35.78	1.90
2.4400	39.22	1.79	35.87	1.91
2.4500	39.20	1.80	35.71	1.90
2.4600	39.19	1.81	35.76	1.92
2.4700	39.17	1.82	35.62	1.95
2.4800	39.16	1.83	35.68	1.94
2.4900	39.15	1.84	35.56	1.96
2.5000	39.14	1.85	35.52	1.97
2.5100	39.12	1.87	35.45	1.99
2.5200	39.11	1.88	35.41	2.00
2.5300	39.10	1.89	35.41	2.00
2.5400	39.09	1.90	35.41	2.03
2.5500	39.07	1.91	35.42	2.03

2450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
19/Aug/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	36.01	1.80
2.3600	39.36	1.72	35.87	1.79
2.3700	39.34	1.73	35.99	1.82
2.3800	39.32	1.74	35.92	1.81
2.3900	39.31	1.75	35.96	1.83
2.4000	39.29	1.76	35.88	1.83
2.4100	39.27	1.76	35.78	1.85
2.4200	39.25	1.77	35.83	1.85
2.4300	39.24	1.78	35.67	1.86
2.4400	39.22	1.79	35.62	1.89
2.4500	39.20	1.80	35.56	1.89
2.4600	39.19	1.81	35.57	1.92
2.4700	39.17	1.82	35.41	1.93
2.4800	39.16	1.83	35.35	1.92
2.4900	39.15	1.84	35.50	1.94
2.5000	39.14	1.85	35.58	1.97
2.5100	39.12	1.87	35.42	1.97
2.5200	39.11	1.88	35.36	1.96
2.5300	39.10	1.89	35.22	1.98
2.5400	39.09	1.90	35.13	2.01
2.5500	39.07	1.91	35.23	2.01

2450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
22/Aug/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	36.40	1.76
2.3600	39.36	1.72	36.34	1.78
2.3700	39.34	1.73	36.36	1.80
2.3800	39.32	1.74	36.19	1.81
2.3900	39.31	1.75	36.19	1.83
2.4000	39.29	1.76	36.20	1.82
2.4100	39.27	1.76	36.06	1.84
2.4200	39.25	1.77	35.97	1.84
2.4300	39.24	1.78	36.04	1.86
2.4400	39.22	1.79	36.13	1.88
2.4500	39.20	1.80	36.02	1.88
2.4600	39.19	1.81	36.04	1.90
2.4700	39.17	1.82	35.94	1.91
2.4800	39.16	1.83	35.71	1.94
2.4900	39.15	1.84	35.88	1.94
2.5000	39.14	1.85	35.64	1.93
2.5100	39.12	1.87	35.64	1.96
2.5200	39.11	1.88	35.64	1.98
2.5300	39.10	1.89	35.54	1.98
2.5400	39.09	1.90	35.61	2.00
2.5500	39.07	1.91	35.46	2.03

2450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
23/Aug/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	36.74	1.77
2.3600	39.36	1.72	36.65	1.78
2.3700	39.34	1.73	36.44	1.79
2.3800	39.32	1.74	36.61	1.81
2.3900	39.31	1.75	36.62	1.81
2.4000	39.29	1.76	36.39	1.82
2.4100	39.27	1.76	36.35	1.84
2.4200	39.25	1.77	36.34	1.84
2.4300	39.24	1.78	36.46	1.86
2.4400	39.22	1.79	36.26	1.87
2.4500	39.20	1.80	36.36	1.90
2.4600	39.19	1.81	36.32	1.90
2.4700	39.17	1.82	36.29	1.92
2.4800	39.16	1.83	36.33	1.91
2.4900	39.15	1.84	36.05	1.93
2.5000	39.14	1.85	35.94	1.94
2.5100	39.12	1.87	35.96	1.96
2.5200	39.11	1.88	35.87	1.96
2.5300	39.10	1.89	36.02	1.98
2.5400	39.09	1.90	35.81	2.01
2.5500	39.07	1.91	35.80	2.01

2450 MHz Body

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
23/Aug/2011
Frequency (GHz)
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.3500	52.83	1.85	50.65	1.85
2.3600	52.82	1.86	50.43	1.85
2.3700	52.81	1.87	50.41	1.86
2.3800	52.79	1.88	50.39	1.88
2.3900	52.78	1.89	50.18	1.93
2.4000	52.77	1.90	49.91	1.92
2.4100	52.75	1.91	50.19	1.93
2.4200	52.74	1.92	50.23	1.98
2.4300	52.73	1.93	50.16	1.99
2.4400	52.71	1.94	50.22	1.99
2.4500	52.70	1.95	50.48	1.98
2.4600	52.69	1.96	50.26	1.99
2.4700	52.67	1.98	50.01	2.01
2.4800	52.66	1.99	50.03	2.00
2.4900	52.65	2.01	49.94	2.05
2.5000	52.64	2.02	49.72	2.05
2.5100	52.62	2.04	49.84	2.06
2.5200	52.61	2.05	49.68	2.08
2.5300	52.60	2.06	49.91	2.13
2.5400	52.59	2.08	49.84	2.11
2.5500	52.57	2.09	49.87	2.12

APPENDIX E - DIPOLE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Celltech

Certificate No: D2450V2-825_Apr09

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 825

Calibration procedure(s): QA CAL-05.v7
Calibration procedure for dipole validation kits

Calibration date: April 17, 2009

Condition of the calibrated item: In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 22, 2009

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 mW / g
SAR normalized	normalized to 1W	54.4 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.7 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.29 mW / g
SAR normalized	normalized to 1W	25.2 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**25.0 mW /g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.4 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	—	—

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 mW / g
SAR normalized	normalized to 1W	51.6 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**51.6 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.05 mW / g
SAR normalized	normalized to 1W	24.2 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.2 mW /g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.5 Ω + 4.7 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω + 5.6 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 11, 2008

DASY5 Validation Report for Head TSL

Date/Time: 17.04.2009 12:17:23

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN825

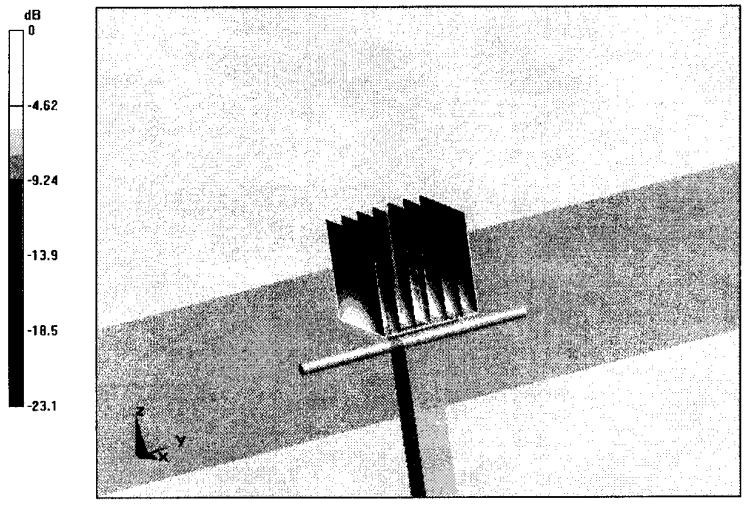
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 1.82 mho/m; ε_r = 38; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

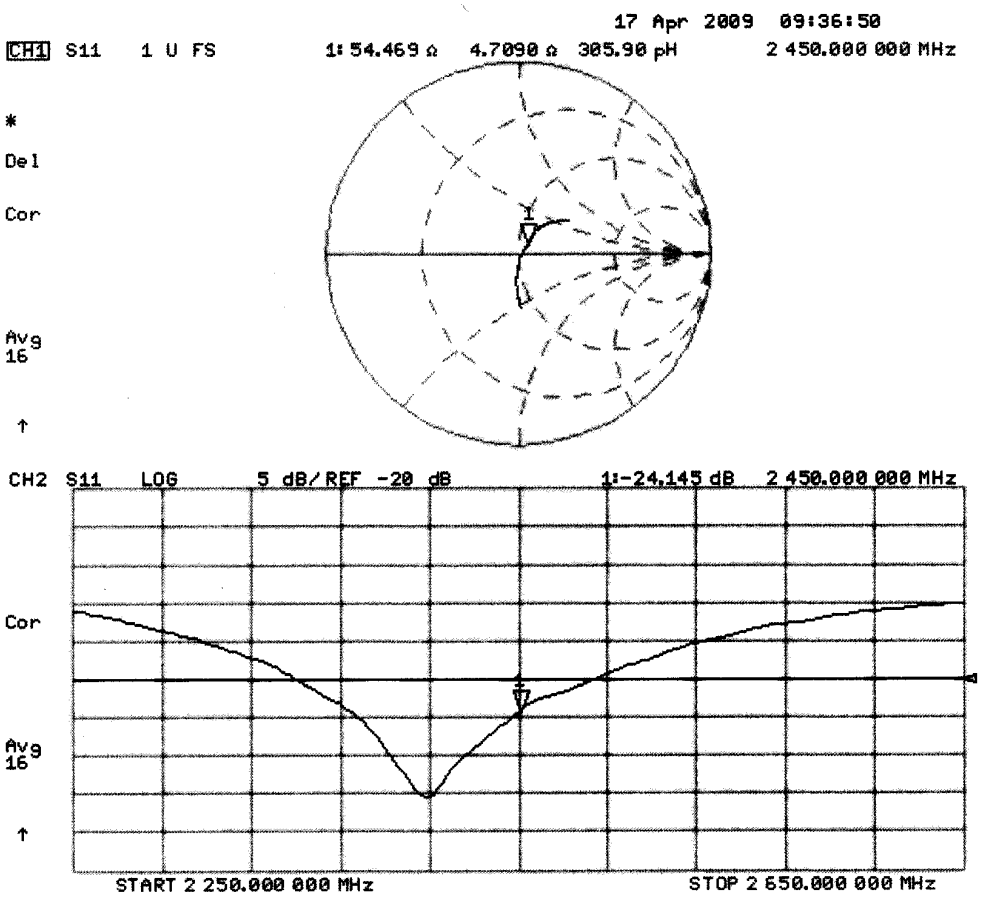
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.1 V/m; Power Drift = 0.026 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.29 mW/g
Maximum value of SAR (measured) = 17.7 mW/g



0 dB = 17.7mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 17.04.2009 14:54:34

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:825

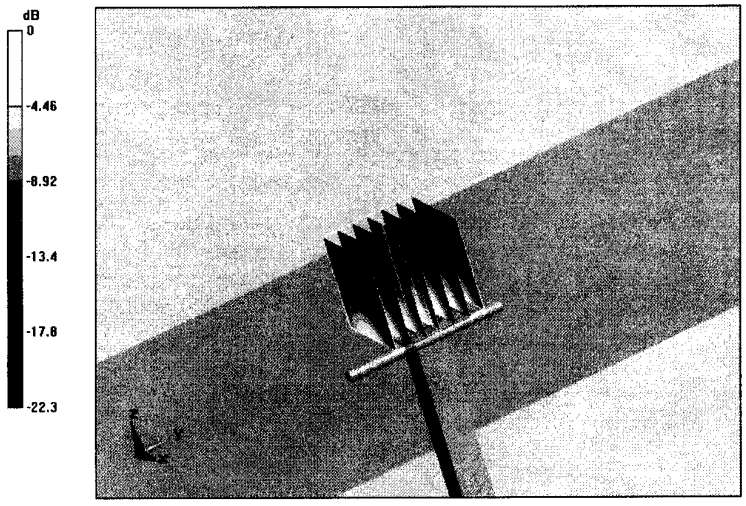
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

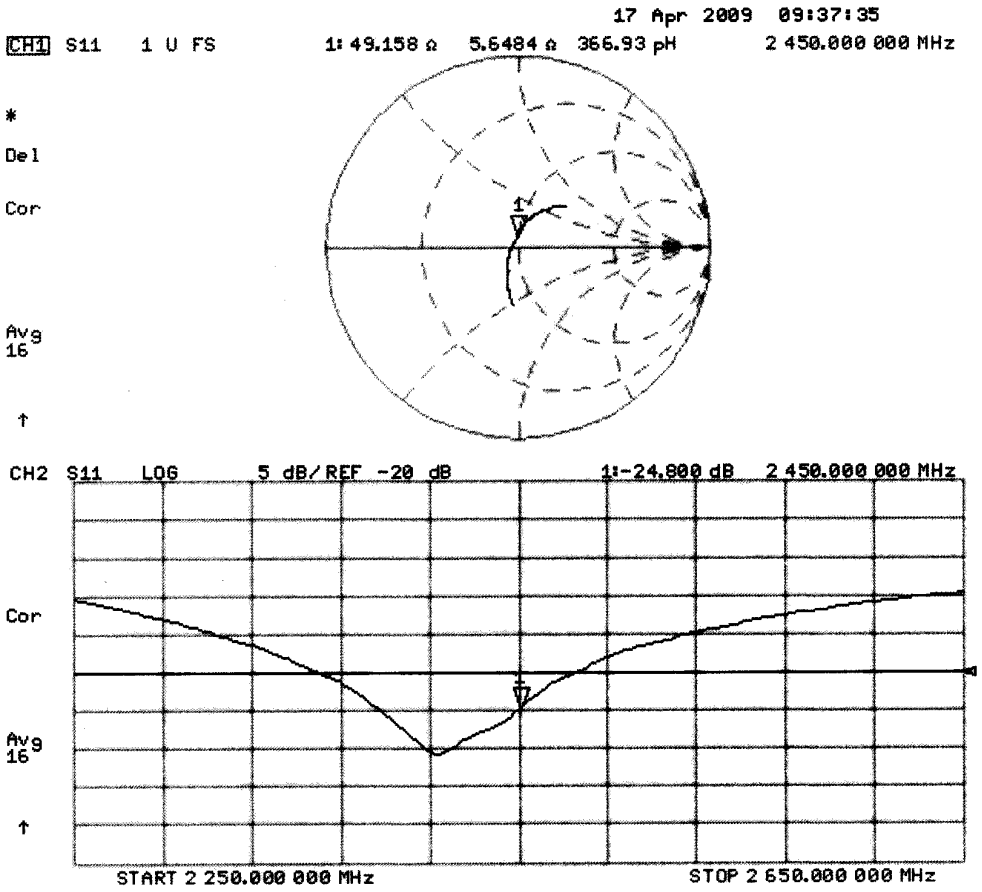
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.6 V/m; Power Drift = 0.046 dB
Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6.05 mW/g
Maximum value of SAR (measured) = 16.6 mW/g



0 dB = 16.6mW/g

Impedance Measurement Plot for Body TSL



APPENDIX F - PROBE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Celltech

Certificate No: EX3-3600_Jun11

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3600

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: June 23, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: June 23, 2011

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z*: *A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \le 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3600

Manufactured: January 10, 2007
Calibrated: June 23, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.50	0.49	0.39	± 10.1 %
DCP (mV)[B]	97.5	102.4	99.3	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	119.9	±3.0 %
			Y	0.00	0.00	1.00	105.4	
			Z	0.00	0.00	1.00	102.1	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	40.0	1.40	7.38	7.38	7.38	0.69	0.66	± 12.0 %
1950	40.0	1.40	7.10	7.10	7.10	0.71	0.64	± 12.0 %
2450	39.2	1.80	6.55	6.55	6.55	0.56	0.73	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

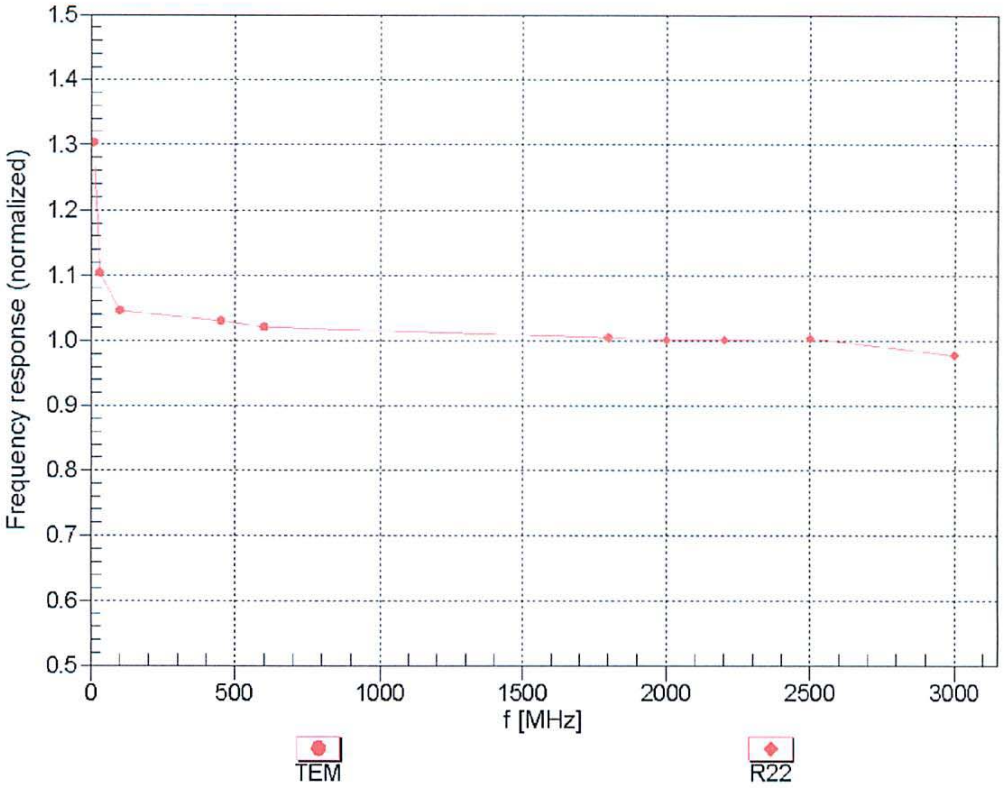
DASY/EASY - Parameters of Probe: EX3DV4- SN:3600

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	53.3	1.52	6.71	6.71	6.71	0.79	0.66	± 12.0 %
1950	53.3	1.52	6.61	6.61	6.61	0.79	0.64	± 12.0 %
2450	52.7	1.95	6.15	6.15	6.15	0.79	0.61	± 12.0 %
5200	49.0	5.30	3.91	3.91	3.91	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.38	3.38	3.38	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.39	3.39	3.39	0.60	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

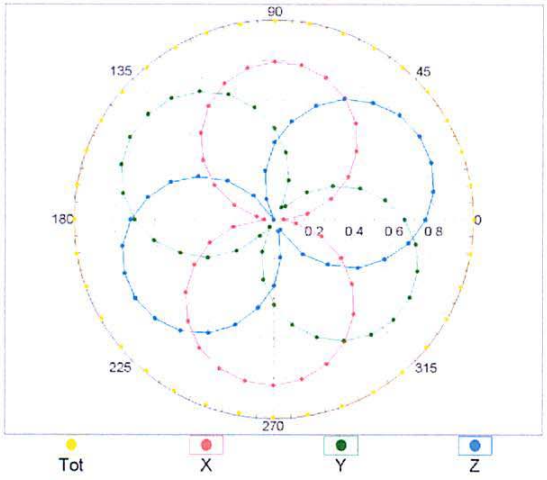
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



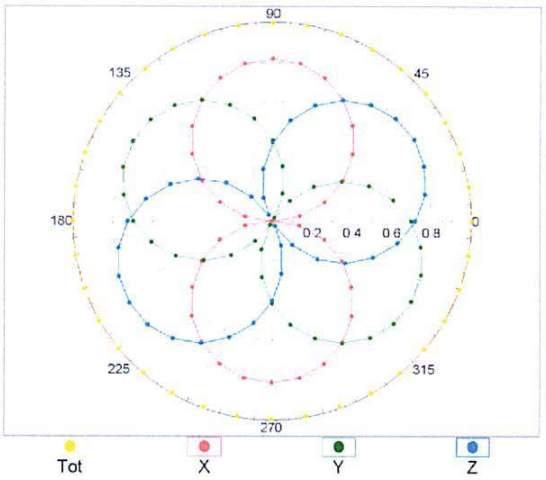
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

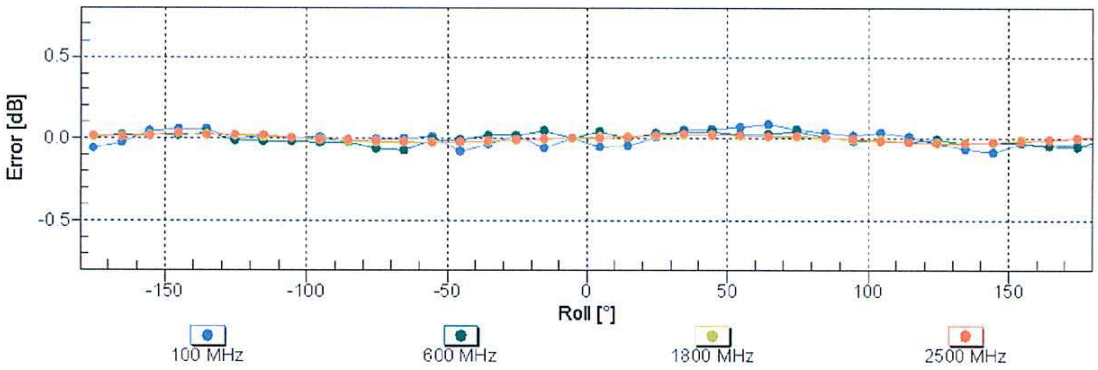
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



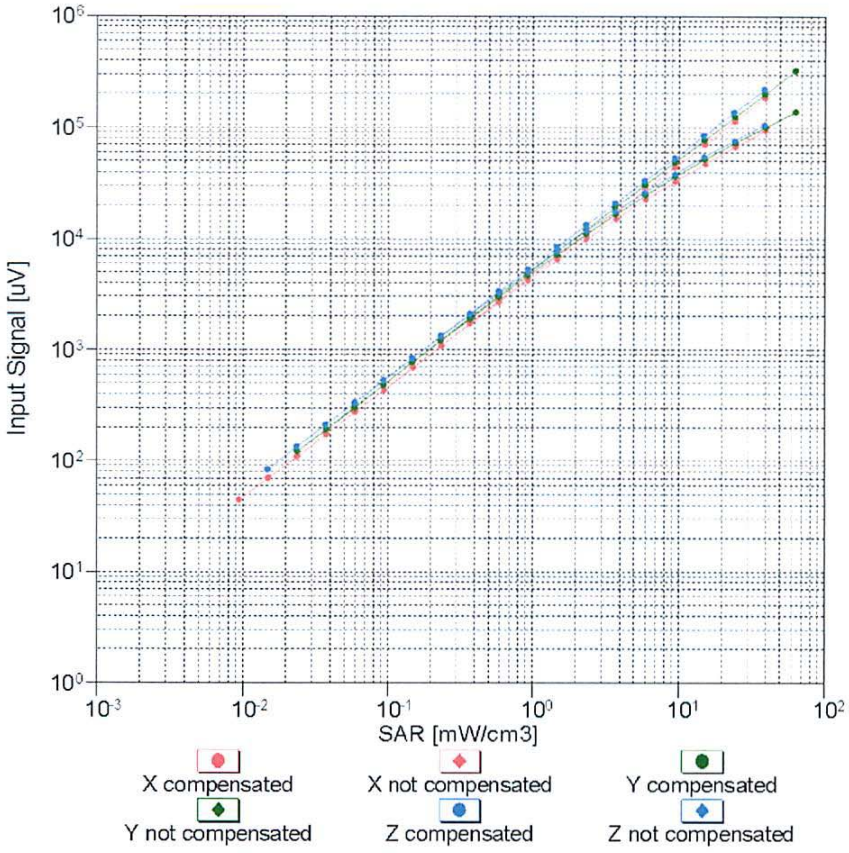
f=1800 MHz,R22

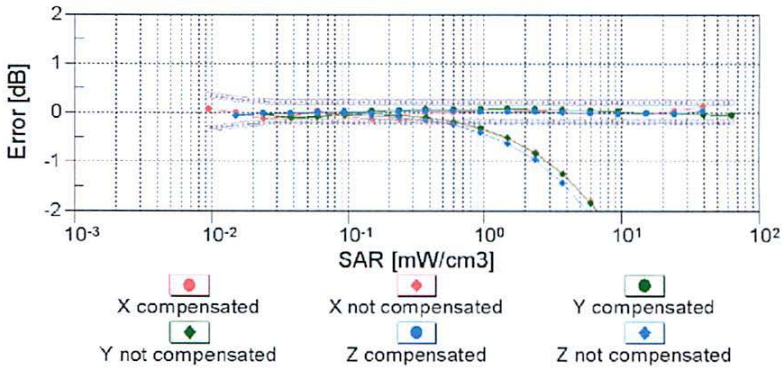




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

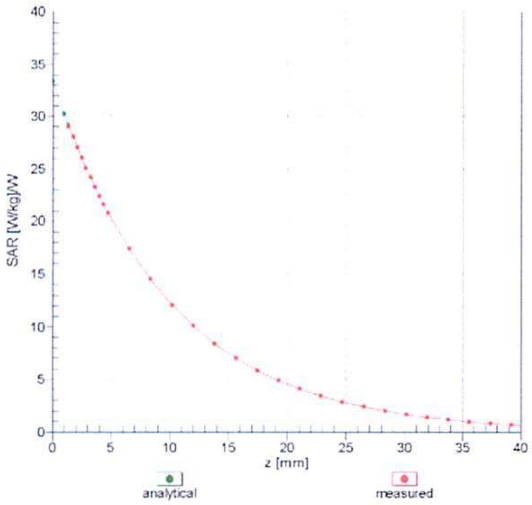




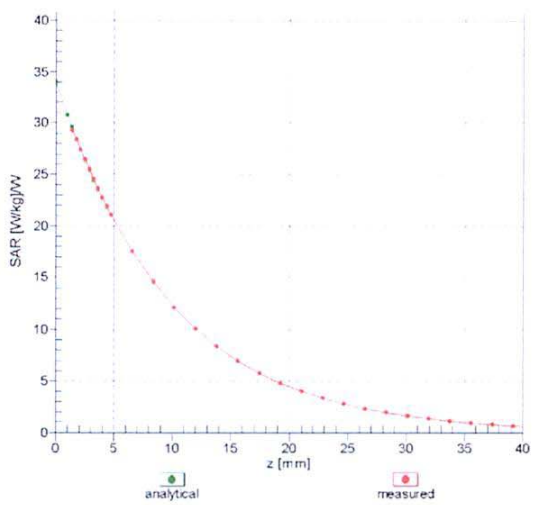
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 2450 MHz,WGLS R22 (H_convF)

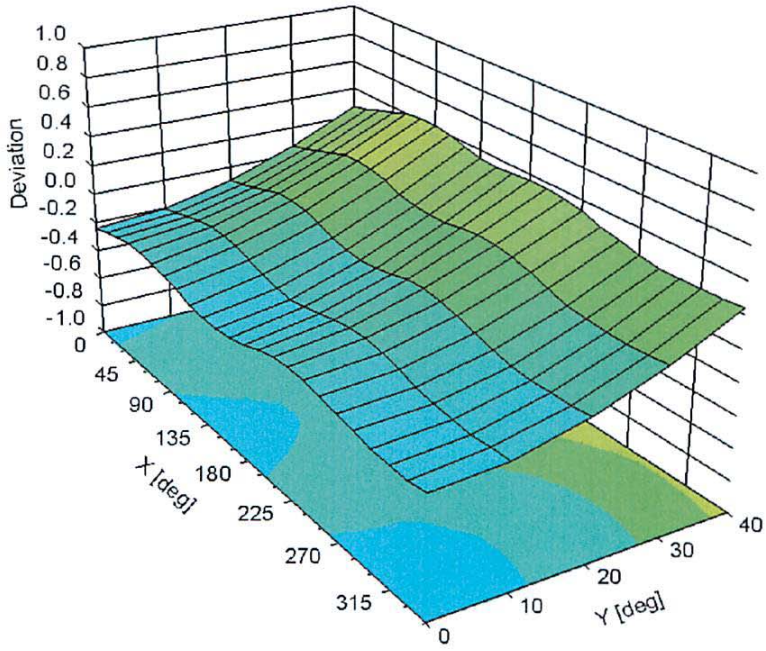


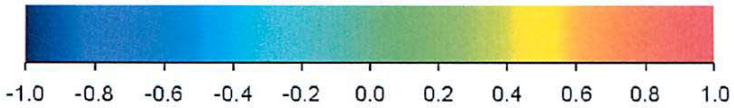
f = 2450 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 18.11.2001

Signature / Stamp

Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79